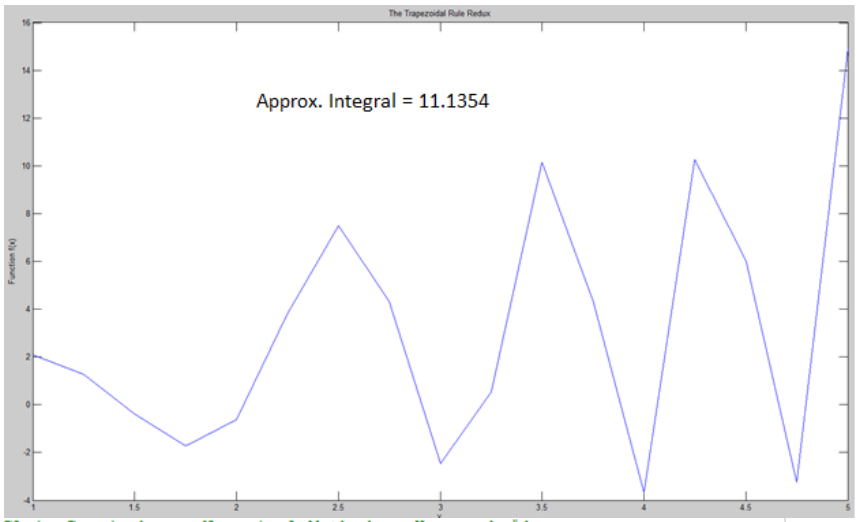
The Trapezoidal Rule Redux

The homework was to solve for the approximate integral of $f(x) = x+2*x*cos(x^2)$ given the limits $1 \leq x \leq 5$ and that there are 16 Divisions. Using both Matlab and excel and comparing to the already made Labview data to ensure consistency and some accuracy.

Matlab:

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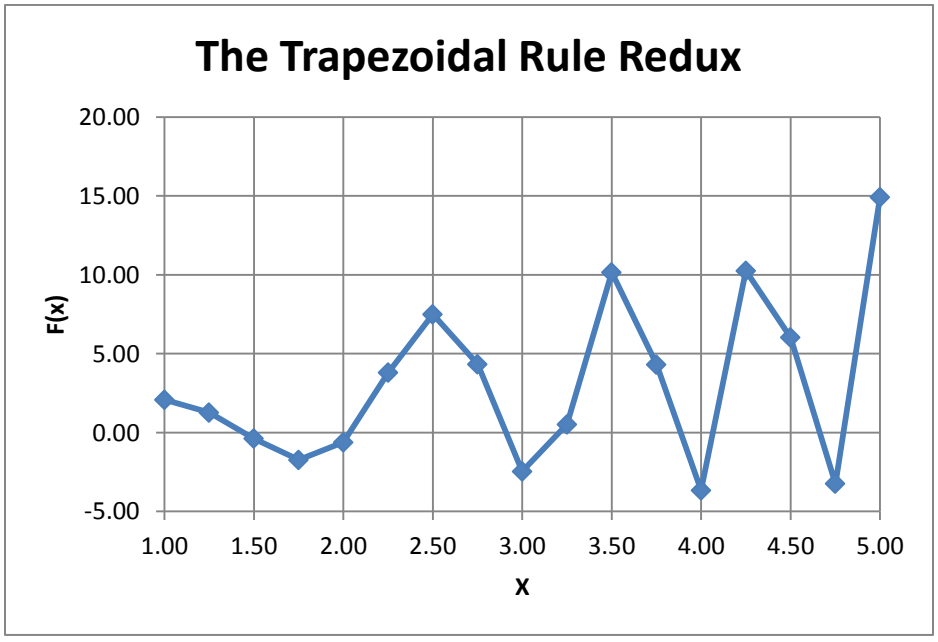
%Clair Cunningham   Numerical Methods   Homework #4
%Approximates value of the integral over the given range of x using the Trapezoidal Rule
%f(x) = x + 2*x*cos(x^2);
clear all; close all; clc;
N = 16;
a = 1;
b = 5;
dx = (b-a)/N;
fxt = 0;
for i=0:N
    x = a+i*dx;
    xa(i+1) = x;
    fxa(i+1) = x + 2*x*cos(x^2);
    fxt = fxt + fxa(i+1);
end
fxt = fxt*dx - (dx/2)*(fxa(1)+fxa(N+1));
appFx = fxa(N+1);
plot(xa,fxa);
ylabel('Function f(x)'); xlabel('X'); title('The Trapezoidal Rule Redux');
```

Excel:



Clair Cunningham Homework #4 Numerical Methods

The Trapezoidal Rule Redux		
Lower Limit(a)	Upper Limit(b)	Divisions(N)
1	5	16

X	F(x)	Delta X
1.00	2.08	0.25
1.25	1.27	
1.50	-0.38	
1.75	-1.74	Sum of all f(x)*dx
2.00	-0.61	13.26
2.25	3.79	
2.50	7.50	(f(a)+f(b))*-dx/2
2.75	4.33	-2.124079091
3.00	-2.47	
3.25	0.52	Approximate Integral
3.50	10.15	11.14
3.75	4.31	
4.00	-3.66	
4.25	10.25	
4.50	6.03	
4.75	-3.24	
5.00	14.91	

The Trapezoidal Rule Redux		
Lower Limit(a)	Upper Limit(b)	Divisions(N)
1	5	16

X	F(x)	Delta X
1	=$A6+$A6*2*COS($A6^2)	
1.25	=$A7+$A7*2*COS($A7^2)	
1.5	=$A8+$A8*2*COS($A8^2)	=(B3-A3)/C3
1.75	=$A9+$A9*2*COS($A9^2)	Sum of all f(x)*dx
2	=$A10+$A10*2*COS($A10^2)	
2.25	=$A11+$A11*2*COS($A11^2)	=SUM(B6:B22)*C6
2.5	=$A12+$A12*2*COS($A12^2)	(f(a)+f(b))*-dx/2
2.75	=$A13+$A13*2*COS($A13^2)	
3	=$A14+$A14*2*COS($A14^2)	=-C6/2*(B6+B22)
3.25	=$A15+$A15*2*COS($A15^2)	Approximate Integral
3.5	=$A16+$A16*2*COS($A16^2)	=C10+C13
3.75	=$A17+$A17*2*COS($A17^2)	
4	=$A18+$A18*2*COS($A18^2)	
4.25	=$A19+$A19*2*COS($A19^2)	
4.5	=$A20+$A20*2*COS($A20^2)	
4.75	=$A21+$A21*2*COS($A21^2)	
5	=$A22+$A22*2*COS($A22^2)	

Labview: